

Waikato District Health Board

A Report by the Deputy Health and Disability Commissioner

(Case 19HDC00924)



Health and Disability Commissioner
Te Toihou Hauora, Hauātanga

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Executive summary

1. A baby was born extremely premature and developed necrotising enterocolitis,¹ which required urgent surgery. The decision was made to take the baby to surgery, and an operating theatre was booked. However, there was a delay of over three hours in taking the baby to surgery. During this time, the baby continued to deteriorate. Sadly, the baby died.
2. This report considers the care provided to the baby by Waikato District Health Board (WDHB), and, in particular, the delay in getting the baby into the operating theatre.

Findings

3. The Deputy Commissioner found that the delay in taking the baby to surgery was the result of a breakdown in communication between teams, which meant that there was no review of the care pathway and, as a result, the baby did not receive services in a timely manner. The Deputy Commissioner concluded that WDHB breached Right 4(5) of the Code.

Recommendations

4. WDHB agreed to undertake an audit of wait times for acute surgery in paediatric operating theatres, and to provide an update on any action, including any additional quality improvement initiatives, undertaken by WDHB, and provide an update on the introduction of its new system of categorising acute surgical urgency.
5. WDHB also agreed to provide a written apology to the parents.

Complaint and investigation

6. The Health and Disability Commissioner (HDC) received a complaint from Ms A about the services provided to her baby daughter by Waikato District Health Board (WDHB). The following issue was identified for investigation:
 - *Whether Waikato District Health Board provided Baby A with an appropriate standard of care on 26 Month2 2018.*
7. This report is the opinion of Rose Wall, Deputy Commissioner, and is made in accordance with the power delegated to her by the Commissioner.
8. The parties directly involved in the investigation were:

Ms A
WDHB

Complainant/consumer's mother
Provider

¹ Inflammation of the intestine causing damage to the tissue.

9. Further information was received from:

Dr B	Paediatric surgeon
Dr C	Neonatal paediatrician

10. Also mentioned in this report:

Dr D	Surgical fellow
Dr E	Paediatric anaesthetist

11. Independent expert advice was obtained from a paediatric surgeon, Professor Spencer Beasley (Appendix A).

Information gathered during investigation

Introduction

12. Baby A was born extremely premature and developed necrotising enterocolitis,² a surgical emergency that is a known risk for newborn babies, particularly those born prematurely. Infants with necrotising enterocolitis who require surgery have a very high mortality rate.
13. This report concerns the care provided to Baby A on 26 Month^{2,3} and, in particular, the delay in getting Baby A into surgery.
14. I have also considered the adequacy and appropriateness of the care provided to Baby A in the five days prior to 26 Month². Guided by expert advice from paediatric surgeon Professor Spencer Beasley, I am satisfied that the care provided in this period was generally appropriate and in accordance with accepted standards. Accordingly, the focus of this report is on the care provided to Baby A by WDHB on 26 Month² — in particular, the over three-hour delay in transferring Baby A to surgery.

Background

15. On 5 Month¹, Baby A was born extremely premature at 25 weeks' gestation,⁴ weighing 826g. Baby A's Apgar scores were 3 at 1 minute, and 6 at 5 minutes.⁵ Baby A had a number of co-morbidities that made her very unwell, and initially she was fully ventilated and transferred to the Neonatal Intensive Care Unit (NICU) following birth.

² Inflammation of the intestine causing damage to the tissue.

³ Relevant months are referred to as Months 1–2 to protect privacy.

⁴ Generally, a baby is considered to have reached full term at 37 to 38 weeks' gestation.

⁵ An index used to evaluate the condition of a newborn infant based on a rating of 0, 1, or 2 for each of the five characteristics of colour, heart rate, response to stimulation of the sole of the foot, muscle tone, and respiration, with 10 being a perfect score.

16. On 7 Month1, expressed breastmilk feeds were started. On 9 Month1, when Baby A was five days old, she developed significant abdominal distention (swelling), with apnoea⁶ and bradycardia⁷ noted with feeds. Baby A was taken to surgery and found to have a perforation in the ileum⁸ and a small amount of early necrotising enterocolitis. An ileostomy⁹ at the site of perforation was performed.
17. Following surgery, Baby A remained stable, and on 16 Month1, when Baby A was 11 days old, trophic feeds¹⁰ were recommenced.
18. On 20 Month1, Baby A underwent further surgery because the stoma¹¹ prolapsed. Following surgery, Baby A remained stable, and on 29 Month1 feeds were restarted and steadily increased until she was on full enteral feeds (180ml/kg/day) by 9 Month2. Consultant paediatric surgeon Dr B told HDC that “[Baby A] made a very good recovery, so much so that her intravenous line was requested to be removed on 11 [Month2]”.
19. From 20 Month2, stoma output increased, although Baby A remained stable. This was an early sign that something might be going wrong. On 22 Month2, the decision was made to change from breast milk to a special formula feed, Pepti Junior. Over the next two days, stoma output decreased and Baby A’s abdomen was described as distended but soft. However, on 24 Month2, the stoma output was noted to have increased again, and had the appearance of pale bile-stained nasogastric aspirates.¹² The cause remained unclear.
20. On 25 Month2, Baby A experienced a number of episodes of bradycardia and oxygen desaturations that required stimulation. Her abdomen was noted to be “grossly” distended. No changes were made to her management at that time.

26 Month2

21. On 26 Month2 at 3.30am, Baby A experienced a further episode of bradycardia and oxygen desaturation, and required resuscitation. At that time, Baby A was noted to be looking dusky,¹³ and she had a “hugely” distended abdomen that was firm to touch. Feeds were stopped immediately, blood tests performed, and an abdominal X-ray ordered.
22. At 6.47am, an abdominal X-ray showed free air in Baby A’s abdomen, indicating perforation, and necrotising enterocolitis was suspected.

⁶ Temporary cessation of breathing.

⁷ Slow heart rate.

⁸ A hole in part of the intestine.

⁹ Where the small intestine is diverted through an opening (stoma) in the abdomen.

¹⁰ The introduction of small amounts of feed to stimulate and supply the developing gastrointestinal system.

¹¹ An opening in the abdomen.

¹² The drainage of the stomach contents via a tube that is inserted via the nose. Bile-stained aspirates can be an indicator of necrotising enterocolitis.

¹³ Blueish tinge.

23. In a statement from Dr C, a neonatal paediatrician for NICU on the morning of 26 Month2, by 8am it was obvious that Baby A required surgery, and so the paediatric surgical team was informed.
24. Before the surgical team reviewed Baby A, she experienced a “significant desaturation [and] bradycardia associated [with a] large spill [and a] need for [increased] respiratory support”. The decision was made to intubate Baby A and start ventilation. It was noted that intubation was difficult because of her abdominal distension.

Delay in surgery — 9.14am to 12.30pm

25. At approximately 8.30am, surgical fellow Dr D attended to assess Baby A, and the decision was made to take her to theatre. Dr D then informed Dr B, the theatre coordinator, and the duty anaesthetist of the need for Baby A to be taken to theatre promptly. At 9.14am, the acute booking form was received by the anaesthetist. Although Dr B was not the on-call paediatric surgeon that day, because of her previous involvement in Baby A’s care, she agreed to take over Baby A’s care.

Surgical booking process

26. The booking process consists of a booking form, completed by the surgical team and received by theatres, and a telephone call from the surgical team to the duty anaesthetist.
27. The duty anaesthetist’s role is to coordinate and prioritise theatre resources based on patient acuity (as reported by the referring team), and to allocate theatres and anaesthetists in co-ordination with the theatre co-ordinator and the charge anaesthetic technician.
28. WDHB told HDC that at the time Baby A was booked for surgery, it was planned that she would be the next case in the acute theatre.
29. WDHB explained that the general acute theatre “was (and is often) staffed by a paediatric anaesthetist, to facilitate the timely care of sick children”, and that Baby A’s anaesthesia care could be provided only by a paediatric anaesthetist skilled in the care of sick premature neonates. At the time of Baby A’s theatre booking, the paediatric anaesthetist was already deployed with another paediatric case, and it was anticipated that she would be available in the next 1–2 hours. However, the paediatric anaesthetist was engaged with the other patient for longer than expected and, as a result, was not available until after midday — over three hours from the original booking.

Ongoing care of Baby A 9.14am–12.35pm

30. Between 9.14am when Baby A was booked for theatre, until 12.30pm when eventually she was taken to theatre, Baby A became profoundly unwell. At 9.25am, antibiotics were started.
31. At approximately 9.30am, Dr B reviewed Baby A and confirmed Dr D’s assessment. She told HDC: “In addition to the evidence of intestinal perforation [Baby A] also had evidence of portal venous gas¹⁴ which is an indication of severe disease.” At that time, Dr B also

¹⁴ The accumulation of gas in the portal vein and its branches.

discussed the planned surgery with Ms A and Baby A's grandmother, who were in attendance.

32. According to the family meeting notes, the NICU nurse practitioner who was caring for Baby A made repeated calls to the surgical team to let them know of Baby A's change in condition.
33. At 11.30am, Dr D documented that Baby A's abdomen was "tense". Baby A was then seen by a paediatric surgeon, who performed a needle decompression in an attempt to relieve some pressure in Baby A's abdomen.
34. However, during this time there was no further communication with the duty anaesthetist by either the surgical team or NICU regarding expediting Baby A's theatre time, nor was there any communication from the duty anaesthetist to the surgical team regarding the delays.
35. Dr B told HDC that Dr D contacted the operating theatre coordinator several times throughout the morning to see if the theatre time could be brought forward, and was given reassurance that the anaesthetist was on the way and the operating room was ready to go. Dr B said that at one point, Dr D attended theatre in person to discuss the situation with the theatre coordinator. However, WDHB advised that the coordinator is unable to recall "any conversations that conveyed that an alternative plan was required". Further, WDHB said that it is not the role of the theatre coordinator to "make complex clinical risk assessments", and "discussions regarding the medical care of patients are most effective when directed to the designated Duty Anaesthetist".
36. WDHB told HDC:

"Further communication during this period highlighting deterioration in a patient's condition would normally trigger the Duty Anaesthetist to explore alternative plans, even if this may have involved delaying or even cancelling an operation for other, less urgent patients. There was also no communication from the Duty Anaesthetist back to the referring team that the delay [with the paediatric anaesthetist] was ongoing and remained uncertain. Communication back to the referring team may have elicited a request to seek an alternative path."
37. WDHB said that given that these events occurred during a week day, a number of alternative options were available. WDHB noted that there were three paediatric anaesthetists scheduled to elective lists, who potentially could have been redeployed.
38. Dr B told HDC that she was available to go to theatre from the time she was made aware of Baby A's deteriorating condition.

12.35pm — Baby A taken to surgery

39. Dr C told HDC that he returned to NICU at 12.30pm, and at that time he was "disappointed" that Baby A had still not been taken to theatre.

40. At 12.35pm, while Dr C was being briefed on the situation, the orderly arrived to transport Baby A to theatre. Dr C escorted Baby A to theatre to assist with ventilator management.
41. At 1.17pm, surgery was commenced, performed by Dr B. During surgery, advanced necrotising enterocolitis was identified, and the bowel was resected¹⁵ in two areas.
42. Following surgery, Baby A was transferred back to NICU.

Postoperative care

43. Postoperatively, Baby A remained very unstable. Sadly, Baby A died the following day at 10.30am on 27 Month2. The cause of death recorded on the death certificate was “necrotising enterocolitis”.

Further comment by WDHB

44. WDHB acknowledged shortcomings in the care Baby A received. It stated: “Failure to effectively communicate between the key staff is responsible for us not revisiting [Baby A’s] theatre access plan.”
45. The surgical team itself was unaware of the delay, and was of the understanding that the paediatric anaesthetist was on the way. Dr B told HDC that at the time of booking, all the correct steps were taken, and a paediatric anaesthetist was allocated immediately. She said that they understood that the paediatric anaesthetist had finished with the other patient and would be on the way shortly, but the surgical team was not told that they were having ongoing difficulties in the recovery area with the other patient.
46. Dr B stated:

“In hindsight I feel that we [should] have spoken to the duty anaesthetist or even to a senior paediatric anaesthetist such as [Dr E], bypassing the normal processes so that we could have prompt access to a paediatric anaesthetist. Neither myself nor the senior surgical fellow considered this was necessary as we were given assurance that the anaesthetist was on the way.”

47. Dr C stated:

“In my opinion the delay between making a decision to operate by the surgeon and the baby reaching the [operating theatre] is too long, considering the acute nature of the illness and rapid deterioration, although I am not certain if going in earlier by the surgeons would have altered the course in any way.”

48. Dr B told HDC that she believes that Baby A’s condition “was not compatible with life”, and her deterioration started approximately 24 hours prior to her sudden deterioration, and surgery a few hours earlier “would not have brought an outcome any different to what was inevitable”.

¹⁵ When a section of the bowel is removed.

Communication with family

49. Following this incident, the family made a complaint directly to WDHB.
50. Dr E responded to the family in writing. Dr E provided an outline of the events and invited the family to contact him if they had any further questions. Subsequently, on 15 May 2019, a family meeting was held in which the events of 26 Month2 were discussed, and it was acknowledged that poor communication between teams meant that Baby A's situation was not reviewed at any time after the initial decision was made to take Baby A into surgery on the morning of 26 Month2.

Further comment from Ms A

In her complaint to HDC, Ms A stated that by making this complaint, she wanted to ensure that WDHB “reflect further and not let this happen to another baby”.

Responses to provisional opinion

Ms A

51. Ms A was provided with a copy of the “information gathered” section of the provisional opinion.
52. Ms A stated:

“That day (the 26th [Month2]) and the stress from being present during the delays and [Baby A's] deterioration in front of us with what felt like forever to get her to theatre will remain forever with us, and despite the expected outcome, the delay was still very extended. And in a circumstance where a baby may have had a really good chance at survival (I understand [Baby A's] wasn't great), this delay could've been the difference between life and death.

...

I initiated this investigation simply to see if processes needed adjusting to have one less case like this happen. Whether it be a new communication procedure or earlier intervention for suspected NEC or something else. And I can see that it has. I really do hope it may help processes in future with sick babies.

I would like to finally say, that despite the above comments, all of the staff, were always kind, welcoming, reassuring, and made me feel like [Baby A's] mum. On the day of the 26th [Month2], the staff continuously kept us informed and comfortable, they gave us privacy, support and made room for us to hold [Baby A's] hands during her interventions. I could see the frustration and concern they were experiencing from the delays as much as we were. And I really do appreciate every one of them for doing everything and allowing us to remain in a parent room the night of the 26th to be close to our daughter overnight as well as letting us hold her peacefully as she passed on the 27th [Month2].”

WDHB

53. WDHB advised that it agrees with the findings of the provisional opinion and proposed recommendations.
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Opinion: Waikato District Health Board — breach

Introduction

54. WDHB was responsible for ensuring that Baby A was provided with services that complied with the Code of Health and Disability Services Consumers' Rights (the Code), and for having in place adequate systems to ensure that the care delivered to Baby A was safe, appropriate, and timely. In my view, for the reasons set out below, the over three-hour delay in transferring Baby A to surgery was a failure by WDHB to provide Baby A with appropriate care.
55. I note the view of Professor Beasley and the clinicians involved in Baby A's care that it is uncertain whether, had Baby A been able to get to theatre earlier, the outcome would have changed. Extremely premature babies such as Baby A are at risk of complications, including necrotising enterocolitis, and there was always a chance that she might not survive. However, the delay was avoidable and, as noted by Professor Beasley, the issues identified in this case could make a difference to another patient, in similar circumstances.

Commencement of antibiotics

56. At 3.30am on 26 Month2 (when Baby A was 51 days old), Baby A experienced a sudden deterioration. NICU staff responded by immediately stopping feeds and arranging for bloods and an abdominal X-ray, which revealed free air in the abdomen, indicating perforation. Necrotising enterocolitis was suspected.
57. Dr C said that by 8am it became obvious that Baby A required surgery, and review by the paediatric surgical team was requested. Following the surgical team's review, antibiotics were started.
58. My expert advisor, paediatric surgeon Professor Spencer Beasley, advised:
- “At most, with the advantage of hindsight, the significance of the clinical deterioration might have been picked up a few hours earlier, and that the antibiotics would have been better administered 6 hours earlier.”
59. I accept Professor Beasley's advice that while ideally antibiotics would have been started at 3.30am, this comment is made in hindsight, knowing the subsequent surgical findings. Accordingly, I am satisfied that the care up to the point when the decision was made to take Baby A to surgery was reasonable in the circumstances.

Decision to proceed with surgery

60. At around 8.30am, Baby A was reviewed by the paediatric surgical team — initially by Dr D, and then by Dr B — and the decision was made to proceed with surgery.
61. Professor Beasley advised that the decision to operate on Baby A at that time was appropriate in the circumstances. He said that there was evidence of full thickness bowel necrosis and cardio-respiratory deterioration, which indicated that surgery was appropriate. Professor Beasley stated: “In this situation, my expectation [is] that all specialist paediatric surgeons would have advised surgery.”
62. I accept that advice and am satisfied that the decision to proceed with surgery on the morning of 26 Month2 was appropriate.

Communication between teams and delay in surgery

63. My primary concern is about the breakdown in communication between the various teams involved in Baby A’s care after the decision was made to operate on Baby A at around 8.30am on 26 Month2.
64. Surgery was booked by surgical fellow Dr D. Dr D contacted the theatre booking coordinator and duty anaesthetist by telephone to schedule the surgery and communicate the urgency of the situation. At 9.14am, the electronic booking form was received by the duty anaesthetist. Baby A was scheduled to be the next case in the acute theatre.
65. WDHB advised that at the time of the theatre booking, the paediatric anaesthetist allocated to Baby A’s case was already deployed with another paediatric case, and it was anticipated that she would be available in the next 1–2 hours.
66. Professor Beasley advised that in this clinical situation the aim would be to get the patient to the operating theatre within about two hours of the decision to operate being made. However, he advised that a case of this complexity may take longer, owing to the logistics of accessing theatre space at short notice and securing staff. When this occurs, normally there is a discussion between the surgeon, anaesthetist, and theatre booking coordinator to make a decision about whether alternative arrangements need to be made, such as reprioritising theatre lists or opening a second theatre.
67. Between 9.14am and 12.30pm, Baby A continued to be cared for in NICU. During that time, Baby A continued to deteriorate. As noted by Professor Beasley:
- “[F]or [Baby A’s] family at the time, as the morning dragged on, the apparent inactivity for such a long period would have heightened their stress and concern. This would have been exacerbated because they had been told that surgery was urgent, and because of their previous experience (previous laparotomies) with [Baby A].”
68. I agree. As discussed above, while earlier surgery may not have changed the eventual outcome, this does not diminish the distress caused to Baby A’s parents.

69. At 9.30am, Dr B reviewed Baby A and confirmed Dr D's decision to proceed with surgery. At 11.30am, a paediatric surgeon undertook a needle decompression in an attempt to relieve some pressure in Baby A's abdomen.
70. Dr B told HDC that Dr D contacted the operating theatre coordinator several times throughout the morning to see whether Baby A's theatre time could be brought forward, and was given reassurance that the anaesthetist was on the way and the operating room was ready to go. Dr B said that at one point, Dr D attended theatre in person to discuss the situation with the theatre coordinator. However, WDHB told HDC that the coordinator is unable to recall "any conversations that conveyed that an alternative plan was required".
71. After the initial booking was made, the duty anaesthetist was not contacted directly by either the surgical team or the NICU team regarding expediting Baby A's theatre time, nor was there any communication from the duty anaesthetist to the surgical team regarding the delay in the arrival of the paediatric anaesthetist. WDHB told HDC:
- "Further communication during this period highlighting deterioration in a patient's condition would normally trigger the Duty Anaesthetist to explore alternative plans, even if this may have involved delaying or even cancelling an operation for other, less urgent patients. There was also no communication from the Duty Anaesthetist back to the [surgical] team that the delay was ongoing and remained uncertain. Communication back to the referring team may have elicited a request to seek an alternative path."
72. WDHB told HDC that given that these events occurred on a week day, there were a number of alternative options available. WDHB noted that there were three paediatric anaesthetists scheduled to elective lists, who potentially could have been redeployed.
73. Professor Beasley advised:
- "The failure in [Baby A's] case was that effective communication of the ongoing urgency and level of concern about her deterioration with the [duty] anaesthetist did not occur to [the] level required, and this has been acknowledged. There seems to have been good communication with theatre, but inclusion of the [duty] anaesthetist in those discussions appears to have been suboptimal."
74. It is concerning that despite the NICU and surgical teams being aware of the urgency of the situation, this information was not communicated to the duty anaesthetist adequately. It is also concerning that there was a failure by the theatre team to communicate clearly the unexpected delay in the paediatric anaesthetist becoming available. I note that the surgical team was under the impression that the paediatric anaesthetist had finished with the other patient and was on the way to theatre.
75. WDHB has acknowledged that the failure of key staff to communicate effectively is responsible for Baby A's theatre access plan not being reviewed.

Conclusions

76. There is no doubt that the delay in taking Baby A to surgery was unacceptable. This was the result of a breakdown in communication between teams, which meant that there was no review of Baby A's care pathway and, as a result, Baby A did not receive services in a timely manner.
77. Given the number of people involved in Baby A's care, I consider that WDHB must take responsibility for this failure at a system level. Accordingly, I conclude that by failing to ensure cooperation amongst providers to ensure quality and continuity of services, WDHB breached Right 4(5) of the Code.
78. I note that WDHB has been open in its acknowledgment of the failure in this case, and I am reassured by the steps it has taken to prevent an incident like this occurring in the future.

Changes made by Waikato DHB

79. WDHB has made the following changes since this incident:
 - Since 18 March 2019, the duty neonatologist has been removed from other roster activities, and is scheduled to the NICU only.
 - In 2018, it introduced a new role of Acute Service Manager. The role is to assist the facilitation and prioritisation of acute and urgent theatre cases across all specialties.
 - Patients waiting for acute surgery have their waiting times tracked through an acute electronic whiteboard located in the integrated operations centre and monitored by the Acute Service Manager.
 - In 2019, an additional paediatric anaesthetist was employed. WDHB stated: "[T]his has greatly improved the paediatric staffing levels within the acute theatres."
 - The WDHB Theatre and Interventional Governance Group has reviewed options for an updated system of categorising acute surgical urgency. WDHB advised that its preference is to integrate the Non-Elective Surgical Triage (NEST) classification. It stated:

"The NEST classification includes explicit examples about what surgical diagnoses are appropriate for each urgency classification. While the NEST classification does not contain an explicit '2 hour' category, it offers a much more granular and descriptive approach to the categories of urgency than the current system."

Currently, WDHB is in the process of developing and integrating this new system for acute surgical bookings.

- An electronic learning module has been developed to educate resident medical officers who need to book patients for acute surgical procedures. The module includes a typical

conversation with the duty anaesthetist, and information for the booking doctor/team to re-contact if the urgency status changes.

- WDHB has also emphasised to all NICU staff the importance of starting antibiotics early in a clinically deteriorating baby.
80. Dr B told HDC that since this incident they have experienced good feedback from the operating theatres if there are any delays associated with emergency bookings, and when there are critically ill children booked for surgery, communication with the duty anaesthetist and anaesthetic department has been “impeccable especially in relation to timing of surgery”.
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Recommendations

81. In response to the recommendations set out in the provisional opinion, WDHB agreed to provide a written apology to Ms A and Mr A for its breach of the Code. The apology is to be sent to HDC within three weeks of the date of this report, for forwarding to Ms A and Mr A.
82. WDHB has also agreed to:
- a) Undertake an audit of wait times for acute surgery in the paediatric operating theatres. Where any findings demonstrate extended wait times, WDHB should undertake a review of the cause of the delay, and provide feedback on the steps taken to address this.
 - b) Provide a further update on the implementation of actions, including any additional quality improvement initiatives, undertaken by WDHB since this incident.
 - c) Provide an update on the introduction of the NEST classification system.

This information will be provided to HDC within three months of the date of this report.

Follow-up actions

83. A copy of this report with details identifying the parties removed, except WDHB and the expert who advised on this case, will be sent to the Paediatric Society of New Zealand, the Royal Australasian College of Surgeons, and the Health Quality & Safety Commission, and placed on the Health and Disability Commissioner website, www.hdc.org.nz, for educational purposes.

Appendix A: Independent clinical advice to the Commissioner

The following expert advice was obtained from paediatric surgeon Professor Spencer Beasley:

“Thank you for asking me to provide an opinion on the following questions that relate to the care provided to [Baby A]:

1. Whether the time taken from the decision to undertake surgery on 26 [Month2], to the surgery commencing, was reasonable in the circumstances
2. The adequacy of communication between teams regarding the urgency of surgery
3. The reasonableness of the decision to proceed with surgery
4. Any other matters in this case that warrant comment.

The details of the events surrounding this management in hospital are not in dispute, but in brief, are:

5 [Month1]; birth: 25 weeks gestation — v premature, weight 826g

9 [Month1]: US ileal perforation 22cm from ileocaecal valve, isolated resumed early NEC more distally in ileum. Ileostomy fashioned, complicated by stoma prolapse a week later

20 [Month1]: wound dehiscence, laparotomy, end ileostomy.

26 [Month2]: 0730 xray showed free gas, v unwell

0914 decision for surgery. Intubation and resuscitation. Theatre available but delays getting anaesthetist available. Surgical team communicated urgency with the theatre staff, but not adequately with the anaesthetist to be doing the surgery

12.30 theatre: surgery revealed advanced NEC, extensive, haemopneumoperitoneum. Appearance of dead bowel consistent with reasonably long duration of disease, probably well over 24 hours. Sealed off perforation seen (also suggests longer-standing disease). Ongoing deterioration.

27 [Month2] [Baby A] died.

1. Whether the time taken from the decision to undertake surgery on 26 [Month2], to the surgery commencing, was reasonable in the circumstances

Ideally, in this clinical situation the intention would be to get to the operating theatre within about 2 hours of the decision to operate being made. Sometimes the time taken is longer than that because of resuscitation priorities, specifically to make surgery and anaesthesia safer (i.e. a short period of intensive pre-operative resuscitation increases operative safety). But in this case resuscitation was occurring already by the time surgery was decided upon.

In reality, it often takes longer than 2 hours for this type of case to get to surgery. Sometimes this is because of the logistics of accessing theatre space at short notice, and of securing the required staff. For example, the emergency theatre may not become available for a period because of another urgent case that may take a while to finish. But when this happens, there is normally discussion between the surgeon/anaesthetist/theatre booking co-ordinator to make decisions around whether other arrangements can be made, such as cancelling an elective list to accommodate an emergency, or alternatively, opening another theatre and calling in emergency staff. This three-way communication did not occur in this case, which meant that alternative arrangements were not actively sought.

2. The adequacy of communication between teams regarding the urgency of surgery

The failure in [Baby A's] case was that effective communication of the ongoing urgency and level of concern about her deterioration with the paediatric anaesthetist did not occur to the level required, and this has been acknowledged. There seems to have been good communication with theatre, but inclusion of the relevant anaesthetist in those discussions appears to have been suboptimal.

Not all teams were working under the same understanding of the urgency of surgery.

It is uncertain — given all the other logistical requirements that would have been involved — whether better communication between all three parties would have allowed the case to start much more than an hour or so earlier, even with the best intentions. Also, it is highly unlikely that the end result* for [Baby A] would have been any different had that occurred. Nevertheless, with other patients, and in different circumstances, it could have made a difference — and this is one of the reasons [Baby A's] family have requested this review: specifically, in the hope that no future baby in similar circumstances would be compromised.

And for [Baby A's] family at the time, as the morning dragged on, the apparent inactivity for such a long period would have heightened their stress and concern. This would have been exacerbated because they had been told that surgery was urgent, and because of their previous experience (previous laparotomies) with [Baby A].

3. The reasonableness of the decision to proceed with surgery

The decision to operate was reasonable. There was evidence of full thickness bowel necrosis, and physiological cardio-respiratory deterioration indicated that surgery was appropriate.

The operative findings revealed an extent of pathology that was more widespread than anticipated (until laparotomy is performed the actual extent of disease cannot be determined), and suggestive of profound disease for more than 24 hours. That she seemed reasonably well until the day of 26 [Month2] and then deteriorated very quickly is typical with this type of pathology.

In this situation, my expectation is that all specialist paediatric surgeons would have advised surgery.

*As an aside, on the evidence available, I think it highly unlikely that earlier surgery on 26 [Month2] would have changed the ultimate outcome, and even if she had managed to survive there would have been a prolonged period of ongoing suffering, multiple complications and challenges with little certainty about the final outcome and in the interim a likely poor quality of life.

4. Any other matters in this case that warrant comment.

Please see my comments below. The clinicians involved and others commenting on the case from Waikato Hospital have been open and honest in their comments. Examples include acknowledgements: 'Failure to effectively communicate between key staff is responsible for us not revisiting [Baby A's] theatre access plan' and 'Duty anaesthetist not informed of the change in [Baby A's] condition — that was deteriorating so quickly'.

Clearly, they have taken these shortcomings in care that this episode exposed very seriously. To their credit, they appear already to be working towards improving their processes to reduce the chances of a similar occurrence happening in the future.

WHAT HER PARENTS HAVE STATED THEY WANT

1. Acknowledgement of an unacceptable delay getting [Baby A] to the operating theatre. It appears that this has now been given ... From the information provided to me, it is evident there has been a clear acknowledgement by multiple clinicians that there was a delay that was greater than even the clinicians felt was appropriate. Moreover, in addition to this, there is evidence of considerable reflection and review by staff around processes that should be introduced to avoid it happening again.
2. The second request by [Baby A's] parents was around what changes can or should be made to avoid a similar event happening with another patient. The following actions have been instituted or are being reviewed:

ACTIONS:

1. Scheduling changes to the consultant NBU roster now ensure that the duty Neonatologist is only scheduled for the NBU and not elsewhere.
2. Advice that all involved in care have a responsibility to provide feedback to the booking team if they are concerned or become aware of an exceptional delay in the context of ongoing deterioration or knowledge of urgency. This should be part of the culture of the hospital.
3. Tracking live patient waiting times. This is an IT issue.
4. Review of prioritization categorization. Currently, it defines: within 20 minutes, then within 6 hours. I agree with the suggestion already made that it probably needs to have an additional category, being: within 2 hours, for when major organs are at risk.
5. Role of an acuity index measure: this is worth exploring as it may have application to other areas as well.

Each of these is an appropriate and a correct response. I would hope that confirmation of progress in each of these areas should be undertaken.

If this is done, I believe that the very reasonable requests of the family have been fulfilled.

Nothing can replace [Baby A], or the trauma her family have gone through, but at least they would have the satisfaction of knowing that out of this tragedy they have contributed to creating a better and safer health system.

Spencer Beasley
**Clinical Director, Department of Paediatric Surgery
Christchurch Hospital**

The following further advice was received from Professor Beasley:

“Thank you for asking me to provide an expert opinion on complaint 19HDC00924. I am a specialist paediatric surgeon based at CDHB and have no conflict of interest.

This report addresses whether the care that was provided to [Baby A] in the five days prior to 26 [Month2] was adequate and appropriate.

The clinical history is well documented and not in dispute.

Aspects of the history that are particularly relevant to this report (with some additional comments around the interpretation of events by me being added) are:

1. [Baby A] was born at 25 weeks gestation, weighing 826gms with initial Apgar scores of 3 at 1 minute, and 6 at 5 minutes, required mechanical ventilation shortly after birth.
2. Feeds were started on day 3 [and] on day 5 she developed significant abdominal distension and Xray revealed pneumoperitoneum. At laparotomy it was identified she had an ileal perforation 22cm from the ileocecal valve. The differential diagnosis was spontaneous intestinal perforation (SIP) of the premature or neonatal necrotising enterocolitis (NEC). On the basis that a small patch of bowel about 1cm distal to the perforation was thought to be consistent with the appearance seen in necrotising enterocolitis, this was the diagnosis made. No bowel required resection, and a loop ileostomy was performed at the point of perforation.
3. There were some post-operative complications including prolapse of the stoma and wound dehiscence for which she had another laparotomy on day 15.
4. I note the PDA for which she had Indomethacin but required no surgery (i.e had no surgical PDA closure).

5. By day 35 she was on full feeds at 180mls per kg per day and the central line for TPN was removed. At this stage it was probably assumed she was out of immediate trouble, and that her subsequent clinical course would be straightforward (apart from the vagaries of prematurity), even though the abdomen remained softly distended.
6. From the records it seems that her abdomen was fairly consistently round, distended, but soft and non-tender. This is consistent with many premature babies in this situation at this stage, and in itself would not have been a reason for any particular concern.
7. The subtle first sign that something may have be amiss was on day 45 (20 [Month2]) when the ileostomy output was 57mls, whereas previously it has been 25–55mls per day (not particularly significant on its own), but that it was considered ‘offensive’. This is a ‘soft sign’ that was not evident previously but in itself is not diagnostic.
8. The abdomen remained very distended but also remained soft and non-tender. There is no evidence from the case notes that the abdominal distension had changed or that there were signs indicative of intra-abdominal pathology (such as tenderness, guarding, signs of peritonitis). There was no evidence that she had an acute surgical abdomen at that stage. On that day 45 (20 [Month2]), no additional action was indicated; and the evidence suggests she was managed appropriately.
9. Up to this point, all management decisions appear to have been appropriate, even in retrospect.
10. On day 46 (21 [Month2]), the stoma output had increased significantly, to 120mls for the day, and was quite watery. This did represent a change; and is the beginning of the period under critical review in this report.
11. She had a metabolic acidosis on base testing. Treatment with oral sodium bicarbonate corrected the acidosis in about 24 hours. In the presence of dead or ischaemic gut it is typically difficult to correct a metabolic acidosis with NaCO₃, and the acidosis tends to persist. Specifically, if there is significant necrotising enterocolitis that is the cause of a metabolic acidosis, it is often difficult to correct. There is no evidence that the abdominal distension had changed at this point, and the abdomen is still recorded as being soft, with no mention of tenderness. No x-ray was done at this stage, and feeds were continued.
12. This is probably the first day where there would have been some emerging concern about her condition. The combination of increased watery stomal output and metabolic acidosis raises the possibility of ‘something developing’ but it is very non-specific. Given the past history of NEC it may have been appropriate to perform an abdominal x-ray at this stage, but other than that, no particular additional investigation to what was done was required. The Xray in all likelihood would have

- been 'non-specifically abnormal'. Also, consideration might have been given to ceasing the feeds given the higher output from the stoma in combination with the acidosis, but this is a judgement call.
13. By the next day, day 47, 22 [Month2], the clinical signs remained similar, but her feed was changed to Pepti Junior. In that she had been on full feeds previously since day 35 with breast milk the decision to change to Pepti Junior was based on the concern there may be intolerance to breast milk, which sometimes happens. The change in feed was a reasonable decision to make.
 14. On day 48 (23 [Month2]) it seems that the level of anxiety about her had decreased. Stomal losses reduced. There was no evidence of progression of the abdominal signs from previously. The metabolic acidosis was reported to have remained satisfactory, (although I cannot find in the case-notes the actual laboratory results for that day).
 15. It sounds as though the consensus at the time was that the apparent improvement was due to the change in formula, and this belief seems justified at the time.
 16. On day 49 the output remained in normal range, but for the first time there was some blood-stained nasogastric aspirates. This could just be from trauma from the NG tube, and blood in NG aspirates is not normally a feature of NEC. An entry in the case notes reads: 'at reduced base excess' which is presumably a reference to the absence of ongoing metabolic acidosis.
 17. The plan designated at that point identified that the feed was tolerated — but to drop back the feeds if and when there was an increase in stomal losses. In the circumstances, this was reasonable.
 18. It would seem on retrospective review of the case notes that day 50, 25 [Month2], was the first day where there was (or should have been) some concern about her condition, but the evidence was subtle.
 19. And this was when consultation with and involvement of the surgical team occurred, appropriately. The nurse practitioner documented a large spill (it is not clear whether it was a vomit or just a large aspirate from the NG tube) and an increase in stomal losses (almost 50mls in eight hours). The description of the abdominal findings was that it remained distended and soft and was not tender. BE of minus 3.8 would normally be considered of little consequence and would have been considered comforting. The stoma looked fine and urine was being passed. There was no increase in respiratory support required. T 36.7°C is normal.
 20. It was in the afternoon of day 50, 25 [Month2], that there were the first real signs of deterioration occurring. There were bradycardias (excessive slowing of the heart rate), first by 1500 hrs, and desaturations (reduction in the oxygen levels). At one point the child required stimulation. There was an entry suggesting the abdomen was more distended in the afternoon than in the morning. This is a clear indication

- that the abdominal findings needed to be reviewed, and often would be the point at which an Xray of the abdomen would be taken. The stomal output was described as being very watery and yellow, also indicating possible gut pathology, but not diagnostic.
21. By 10 o'clock that evening there was a more profound bradycardia and desaturation, and the abdomen was grossly distended.
 22. In summary, during the latter half of 25th of [Month2] there was gradual but definite deterioration in her general condition. Yet, somewhat surprisingly, her respiratory requirements at this stage had not worsened.
 23. At about 3.30/3.50am the following day, 26 [Month2], day 51 she had a very rapid and profound deterioration in her condition clinically, although her platelets remained surprisingly normal. The O2 requirement had increased to 60%. Feeds were stopped. This is the time where commencing antibiotics should have been considered.
 24. A plain Xray of the abdomen was performed at 0704 after which the paediatric surgical team were asked to review her because it showed free air (which means that the bowel has ruptured).
 25. At 0900 the same morning (26 [Month2]) she required reintubation and ventilation. She now had a severe metabolic acidosis (BE minus 20 just before theatre), was in shock, had coagulopathy, and free air outside the bowel (pneumoperitoneum) on plain x-ray of the abdomen. Her FiO2 was now 100%. She was minimally responsive. Her temperature fell to 35°C. This was when the antibiotics Augmentin 44mg 8 hrly 30 mg/kg/dose (given IV at 0925) and Amikacin 21.9mg at 15mg/kg/dose (given at 0959) were commenced.

Comment:

On days 45–48 there were very few signs of intra-abdominal mischief developing. There was no explanation for the increasing stomal losses or acidosis, and overall her condition seemed stable.

An x-ray performed on days 46–48 may or may not have assisted in a diagnosis being made. It is most probable (with the help of hindsight) that an x-ray then would have shown increased dilatation of the bowel, perhaps with one or two air-fluid levels. It may not have been diagnostic of specific intra-abdominal pathology but could have indicated that there was something happening in the abdominal cavity, meaning that a very close eye on her, and close monitoring, was needed. I suspect it would not have shown any pneumo-peritoneum at that stage, and may not have shown any intramural gas (which would have been diagnostic of neonatal necrotizing enterocolitis (NEC)).

On 24 [Month2], day 49, the addition of increased nasogastric aspirates was concerning. In the absence of abdominal tenderness or radiological evidence of necrotising

enterocolitis, no additional intervention would have been indicated at that point. If imaging (abdominal Xray) had shown NEC, antibiotics would have been started in conjunction with gastric decompression and ceasing all oral intake. Even without radiological evidence of NEC, commencing antibiotics would have been appropriate, again a judgement call.

On day 50, 25 [Month2] it was clear that this child was beginning to deteriorate, although it seems that the full significance of the deterioration was not fully appreciated until late afternoon or evening. Knowing what the subsequent operative findings revealed, I suspect there was already widespread necrotising enterocolitis occurring on the afternoon of that day. At the time the rapid deterioration occurred at 0330 the next morning the ischaemic gut was probably already extensive and full thickness in many areas.

On the basis of the clinical findings, 0330 is the time when most clinicians would have started antibiotics, rather than 0925 (6 hours later). Nevertheless, as it transpired, I doubt that this would have altered the eventual outcome.

Unfortunately, necrotising enterocolitis is quite an unpredictable condition in this situation, and even with aggressive medical management, progression of the disease can still occur.

Although a definitive diagnosis of NEC was not made until 26 [Month2], the management instituted before then was still appropriate and covered that possibility. The only shortcoming in retrospect is that the antibiotics could have been started earlier. Sadly, by day 51, even with prompt surgery at 0900 that morning, the outcome almost certainly would have been no different.

Conclusions:

1. I suspect the perforation on day 3 was SIP (spontaneous intestinal perforation) of severe prematurity, rather than NEC. This is of minor consequence in terms of the subsequent events.
2. There is no evidence of departure from acceptable standards of care from 22–26 [Month2], the period in question.
3. At most, with the advantage of hindsight, the significance of the clinical deterioration might have been picked up a few hours earlier, and the antibiotics would have been better administered 6 hours earlier.
4. A plain Xray of the abdomen could have been performed in the afternoon of 25 [Month2], but the management that was instituted would probably have been the same.
5. Even if imaging had been performed earlier, and antibiotics started during the night (rather than next morning) and surgery undertaken earlier, there is no evidence that the eventual outcome would have been different.

6. It is my opinion that this tragedy is a consequence of the extreme prematurity and the sequelae that are well recognised to occur in some of these babies.
7. I would not recommend any changes to management or clinical guidelines (other than those previously identified with the previous review).

I understand the distress that the loss of their loved child has caused her parents, but I believe they can gain some reassurance that the care that was provided was of a high standard. Although I have identified a couple of areas where interventions or investigations could have been initiated earlier, I doubt that the eventual outcome could have been averted.

Yours sincerely,

Spencer Beasley
ONZM, MS, FRACS"